

Asphalt Roofing Shingles in Asphalt Pavement

Introduction

This fact sheet provides an overview of the use of ground recycled asphalt roofing shingles (RAS) in asphalt pavement. It includes information on potential markets and a discussion on specifications.

Pavement Terminology

A roadway is built in several layers: pavement, base, and sometimes sub-base. The **pavement** is the surface layer. Asphalt pavement is usually referred to as **asphalt concrete (AC)**. The **base** is made of a layer of **aggregate base** over a layer of **aggregate sub-base**. Asphalt concrete is a blend of aggregate and asphalt binder.

Benefits

In addition to saving landfill space, the benefits of using recycled asphalt shingles in AC include possible economic savings and improved pavement performance.

Economics

Asphalt reclamation may produce an immediate economic benefit. California plants produce fiberglass-based shingles, which are approximately 20 percent asphalt. AC is approximately 6 percent asphalt. So a small percentage of shingles (for example, 5 percent by weight of aggregate) can displace a large percentage of asphalt binder (approximately 20 percent).

Other economic factors include recyclers' tipping fees, costs to grind the shingles, the price of virgin asphalt, and transportation costs.

Virgin asphalt binder is derived from petroleum. As oil prices increase, RAS becomes a lower-cost alternative to virgin asphalt.

Pavement Performance

Another benefit may be improved pavement performance. Because the asphalt used in shingles is harder than pavement asphalt, the pavement benefits may include improved resistance to rutting, increased stability, decrease in temperature susceptibility, improved compaction, and improved "rideability" index.

Processing

Hot-mix asphalt (HMA) is the most common process to which shingles can be added. Waste shingles are ground and screened to produce 1/2"-minus-size pieces for batch plants, or 1/4"-minus-size pieces for continuous feed plants. The ground shingles are usually fed into and mixed with the aggregate before adding the virgin asphalt binder. RAS reduces the amount of asphalt binder needed for HMA.

Tear-Off Vs. Manufacturer Scrap

Most specifications for RAS use in HMA require that the mix only include manufacturers' scrap (pre-consumer) or tear-off (post-consumer) material. Most specifications will not allow a mixture of the two. Many specifications call for the use of manufacture scrap, as it does not contain the deleterious material (metal, glass, paper, etc.) found in tear-off loads.

Specifications

A number of laboratory and field projects in North America have tested shingles in AC. Some of these projects have led to specifications from state departments of transportation (DOT).

AASHTO Standard

In 2005, the American Association of State Highway and Transportation Officials (AASHTO) adopted a standard specification (MP 15) for

asphalt shingle use in HMA. This national specification set guidelines for the use of RAS in HMA. It enables HMA producers to design the appropriate mix of RAS in asphalt to meet the specifications of state and local transportation agencies. The AASHTO standard specification allows for the use of either manufacturers' scrap or tear-offs.

AASHTO also adopted a recommended practice (PP 53) as a companion to the standard specification.

For more information on how to order AASHTO's specifications, please see their website: www.transportation.org/.

DOT Specifications

Several state DOTs allow asphalt roofing shingles in asphalt pavement, including the following:

- Georgia (5 percent, manufacturing scrap only).
- Maryland (5 percent, manufacturing scrap only).
- Michigan (50 percent recycled asphalt spec routinely allows old and new shingles, though shingles are not specifically mentioned).
- Minnesota (5 percent, manufacturing scrap only).
- Missouri (up to 5 percent).
- New Jersey (5 percent in "supplemental" spec, manufacturing scrap only).
- North Carolina (5 percent, manufacturing scrap only).
- Ohio (allows "certain percentage of recycled material").
- Indiana DOT (5 percent, manufacturing scrap only).

Research from the Florida DOT State Materials Office indicates that shingles can comprise 5 percent of pavement and even 15 percent if engineered properly.

Local Specifications

The City of Brampton, Ontario, allows 3 percent new and old asphalt roofing shingles in AC.

California Specifications

The key to opening large California markets for asphalt shingles in asphalt pavement is to allow the shingles in California's construction specifications. The specifications most widely used in California are Caltrans specifications and the *Standard Specifications for Public Works Construction* (Greenbook).

Caltrans Specifications

Caltrans specifications are used on Caltrans projects, most local government public works departments in Northern California, and many private projects. Caltrans testing of new road products adds a high level of confidence to a product or method. Caltrans specifications for shingle-content AC would significantly improve marketing prospects for recycled shingles.

Caltrans specifications currently do not allow asphalt shingles in AC.

The process for Caltrans specification writing would include laboratory testing, draft Special Provisions, field testing, and monitoring before Special Standard Provisions (SSP) could be available for routine use by local governments.

Greenbook Specifications

The City and County of Los Angeles and 200 other local governments and agencies in the Los Angeles area use the Greenbook. ***Greenbook specifications currently do not allow asphalt shingles in AC.***

Before a Greenbook could approve specifications for asphalt shingles, a local government must field-test the method and submit test results to the Greenbook committee for evaluation.

Local Government Testing

The most promising market at this time may be local government public works. Although local governments usually use Caltrans or Greenbook specifications, they are free to use any

specifications of their choosing—or develop their own—for projects using local funds.

Local governments could start with existing specifications from other state departments of transportation and adapt them to local needs; test projects could begin with parking lots and low-impact roads. Areas near shingle manufacturing plants, such as the counties of Los Angeles, Orange, Contra Costa, San Bernardino, and Kern, may be particularly interested.

Private Markets and Testing

Private markets include private roads, parking lots, driveways, and farm roads. Although many private owners also depend on Caltrans, Greenbook, or local public works specifications, some may be willing to accept shingles in asphalt, especially if the asphalt is tested for certain quality standards. Approximately eight private laboratories in California test asphalt products.

Resources

For general information on asphalt shingle recycling, including composition, processing, siting, equipment, and other possible products, please visit the Board's Asphalt Shingle Recycling web page: www.ciwmb.ca.gov/ConDemo/Shingles/.

Publications

You can view, print, or download most publications, and search the databases at the Board's C&D website, www.ciwmb.ca.gov/ConDemo/.

Evaluation of the Benefits of Adding Waste Fiberglass Roofing Shingles to Hot-Mix Asphalt, July 1997, Ohio DOT, Office of Materials Management, by CTL Engineering, Columbus, Ohio.

Minnesota's Experience Using Shingle Scrap in Bituminous Pavements, October 1996, Minn. DOT, David Janisch of the Office of Minnesota Road Research, and Curt Turgeon, Metropolitan Division.

Influence of Roofing Shingles on Asphalt Concrete Mixture Properties, June 1993, University of Minnesota, Dept. of Civil and Mineral Engineering.

Mechanistic Evaluation of Asphalt Concrete Mixtures Containing Reclaimed Roofing Materials, N. Ali, Dept. of Civil Engineering, Technical University of Nova Scotia, Canada, Transportation Research Record 1515.

Evaluation of the Benefits of Adding Waste Asphalt Roofing Shingles to Hot Mix Asphalt, Ohio State University, Transportation Technology Transfer Center, Department of Civil Engineering, sponsored by Ohio Department of Transportation and the Federal Highway Administration.

Recovery and Reuse of Asphalt Roofing Waste—Incorporation of Roofing Waste in Asphalt Paving, Vol. I (Lab Investigation) & Vol. II (Analysis), Sept. 1986, University of Nevada, Reno, Nevada; and Manville Sales Corp., Denver, Colorado, for U.S. Department of Energy.

CIWMB Contact

For more information about recycled shingles in asphalt pavement, contact staff in the Board's construction and demolition waste program at (916) 341-6500 or by e-mail at condemo@ciwmb.ca.gov.